



NAVAL SUPPLY SYSTEMS COMMAND

***FISC Puget Sound
Manchester Fuel Department***

An aerial photograph of a waterfront industrial facility, likely a fuel depot. Several large white storage tanks are visible on the shore, and a long pier with various structures extends into the water. The background shows a forested hillside and a body of water.

**Maintenance,
Leak Detection in Large
Underground Storage
Tanks**

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Ready. Resourceful. Responsive!

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BRIEF OVERVIEW

- ◆ **Introduction**
- ◆ **Scope of Military Large USTs**
- ◆ **Issues at Military Storage Tanks**
- ◆ **Types of USTs**

BRIEF OVERVIEW

- ◆ **Typical Construction**
- ◆ **Regulatory Drivers**
- ◆ **Manchester Experience**
 - ◆ *Manchester Terminal*
 - ◆ *Maintenance Methods and History*
 - ◆ *Leak Detection History at MFD*
- ◆ **Conclusions**

Definitions

- ◆ **AFHE – Automated Fuel Handling Equipment**
- ◆ **Atmospheric tanks – vented to Atmosphere – not pressurized**
- ◆ **ATG – Automatic Tank Gaging**
- ◆ **Barrel – 42 US gallons**
- ◆ **DESC – Defense Energy Support Center**
- ◆ **Floating Roof Tanks – Roof floats on product Stored**
- ◆ **Large USTs – USTs larger than 50,000 gallons or 1200 barrels**
- ◆ **Precision Leak Detection – quantitative leak detection at less than 1 gallon/hr.**

Large Military USTs

- ◆ **Army – 4 Large USTS (non active)**
- ◆ **Air Force – 136 Active Large USTS**
 - ◆ ***Biggest is 280,000 Barrels***
- ◆ **Navy 325 Active Large USTs**
 - ◆ ***Biggest is 300,000 Barrels***

Military Storage Tank Issues

- ◆ **Old Infrastructure**
 - ◆ ***Tanks Built in 1940's/1950's***
- ◆ **Storage Requirements**
 - ◆ ***Maintenance of Minimum Volumes for Mission Requirements***
- ◆ **Lack of Guidance**
 - ◆ ***No good standards for Maintenance***
 - ◆ ***No Industry Standard for large USTS***

Military Storage Tank Issues

- ◆ **Technological Limitations**
 - ◆ ***Installed Inventory Management limitations***
 - ◆ ***Precision leak Detection Limitations***
- ◆ **Inconsistent Operator Training Standards**

Results

◆ April 26, 2007 FISC
Pearl Harbor
Reports a loss of
366,000 gallons
from tank 1403
(AST) (later
revised to 359,000
gallons)



Results

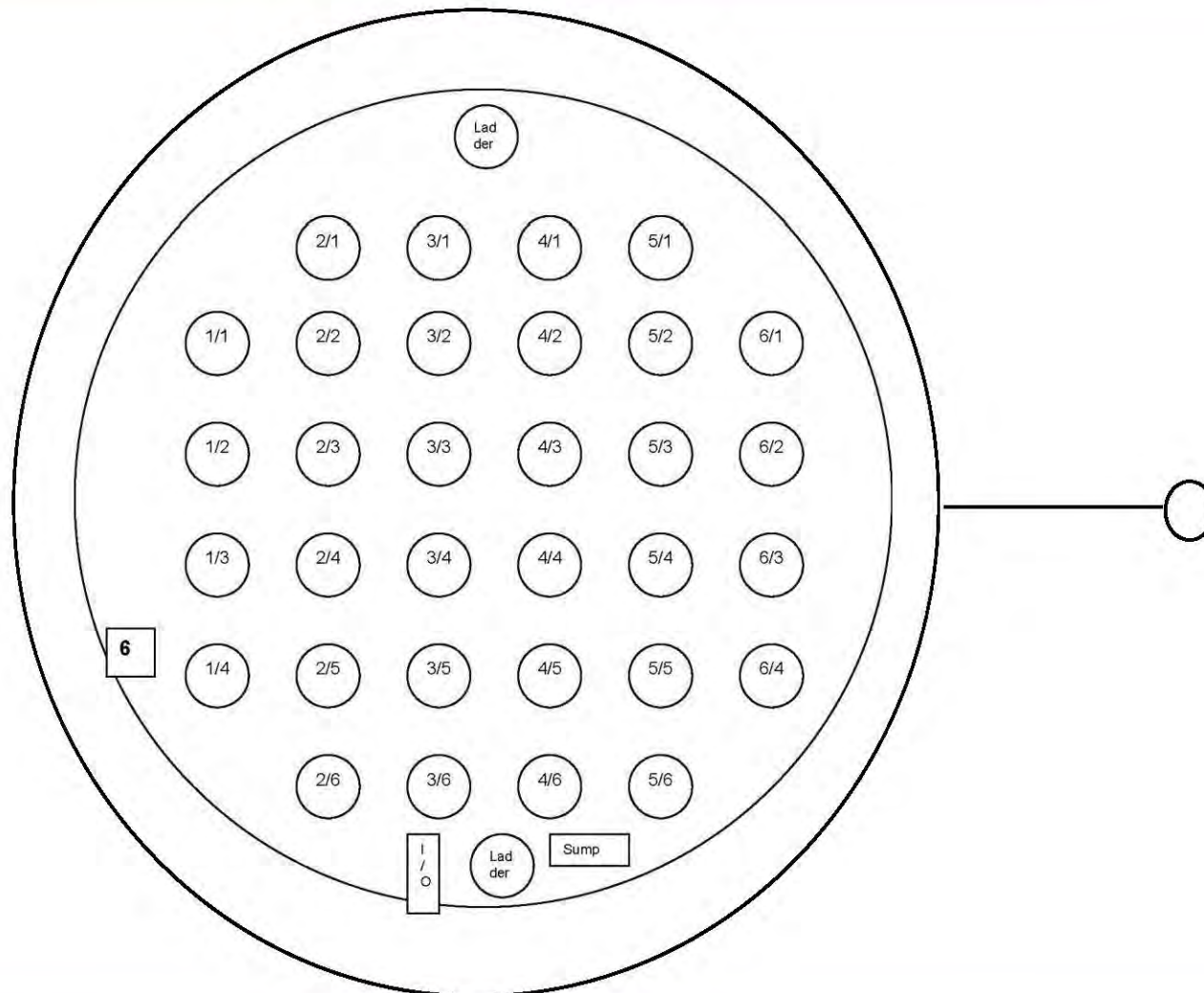
- ◆ Results – a 1 inch by 3 inch hole in sump
- ◆ Operator Error detecting loss



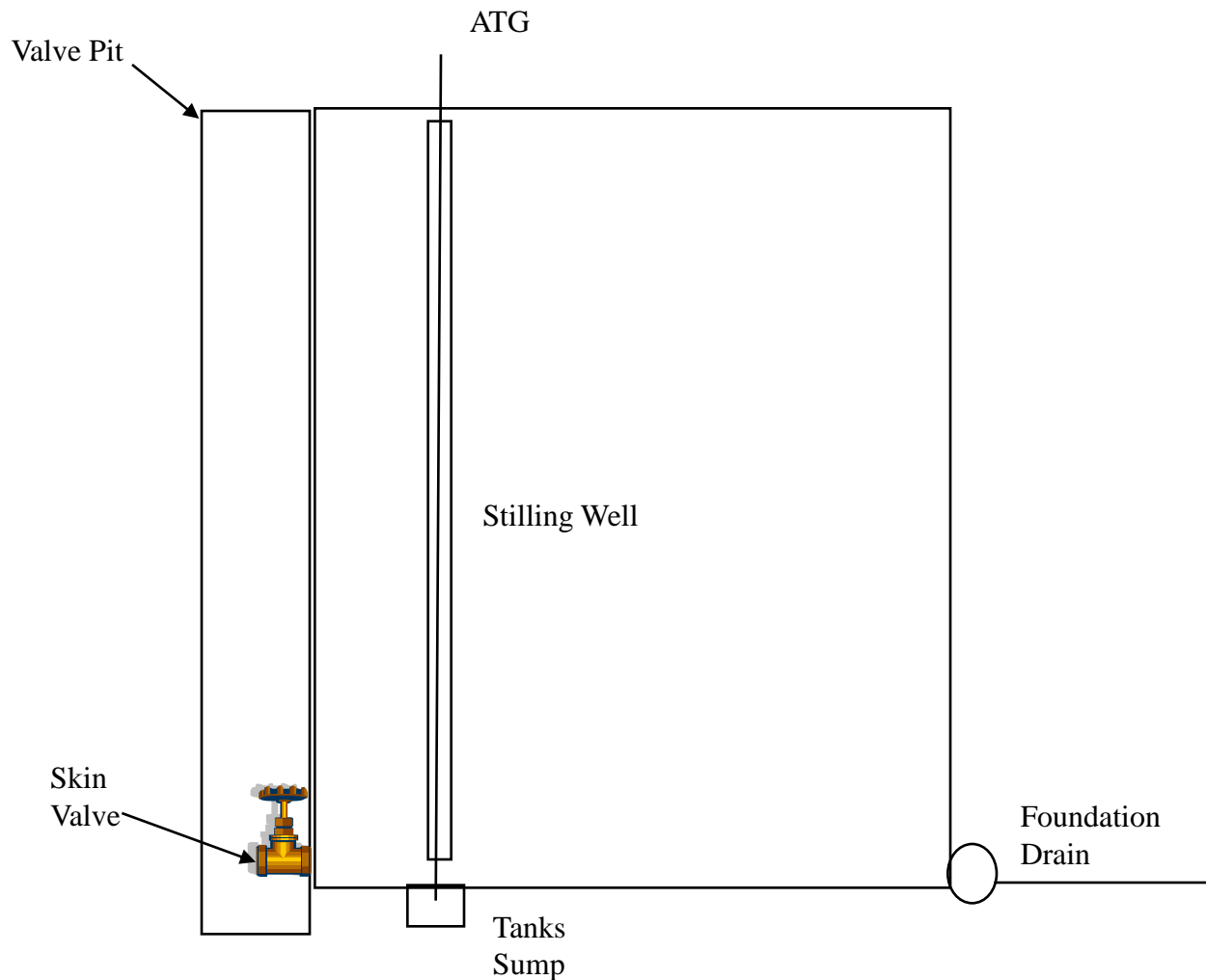
Types of USTs

- ◆ **Concrete**
 - ◆ *Cut and covered*
 - ◆ *Underground Construction*
- ◆ **Steel**
 - ◆ *Cut and covered*
 - ◆ *Riveted Tanks*
 - ◆ *Welded tanks*





Typical construction



Regulatory Drivers

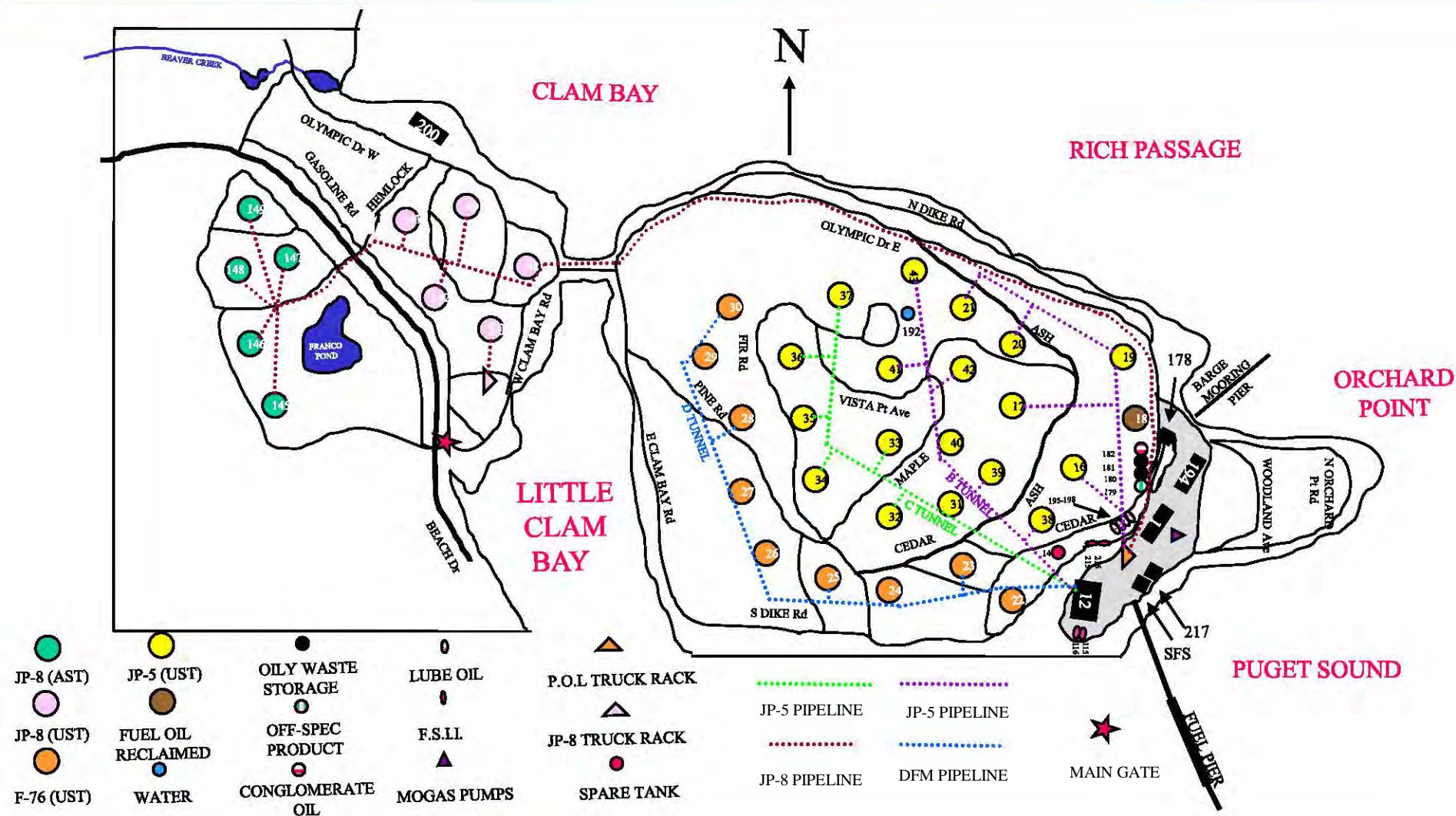
- ◆ **40 CFR 280/281**
 - ◆ *Derives Basic Regulation of Underground Storage Tanks*
 - ◆ *These tanks are Field Constructed – therefore “deferred” (40CFR 280.10)*
- ◆ **State/Local Requirements**
- ◆ **DOD Requirements**

MFD GENERAL INFO

- **Size: Facility encompasses 234 acres and has 1.5 miles of shoreline on Puget Sound and Rich Passage**

- **Personnel: 39 civilian and 2 military operate the facility**

TERMINAL LAYOUT



Terminal Tankage

◆ Underground Storage Tanks

- ◆ 34 Bulk Fuel
- ◆ 5 metal 27/50 MBBL tanks
- ◆ 9 concrete coated 27MBBL tanks
- ◆ 20 concrete coated 47/50Mbbbl Tanks

◆ Aboveground Tanks

- 5 80Mbbbls Bulk tanks
- 4 Lube oil tanks
- 5 Waste Oil/Waste water tanks
- 2 Additive Tanks

38 Bulk Storage Tanks (33 UST / 5 AST)

1,834 Mbbbls (77,009,730 Gallons)

◆ Pipelines

- F76 1.9 miles
- JP8 3.8 miles
- JP5 3.0 miles

- ◆ **Definitive Need to Clean and Inspect Bulk Tanks**
- ◆ **No definitive guidance (API 653 etc.)**
- ◆ **Coating installation challenges**

Coating Issues

◆ Failure at the Tank wall joint (cove Failure



◆ Failure of floor coating



Further Challenges

◆ Leaking Skin
Valves/Pipe nipples







◆ Leaking older
Tank Penetrations



- ◆ **Tank Inspection Repair**
- ◆ **Pipelines**
- ◆ **Leak Detection**
- ◆ **Cathodic Protection**

Manchester Methods

Detailed Inspection

-  ***Visual***
-  ***Dye Penetrant***
-  ***High Voltage Holiday Detection***
-  ***Ultrasonic***

Repairs

-  ***Coating***
-  ***Penetrations***
-  ***Valves***

Maintenance Validations

◆ **Final Inspections**

◆ **Leak Detection**

Leak Detection

◆ Arizona Instruments

- ◆ *Vapor Detection Technology*
- ◆ *Failed due to complexity, and preexisting vapors in soil matrix*

◆ Tracer Technology

- *Requires Injection of Trace Elements*
- *Tanks are Atmospheric, vented*
- *Soil Matrix is not homogenous*

◆ AFHE XLD 2000

- *Technology relied on software for temperature/atmospheric pressure correction*
- *Complicated analysis of plots required*
- *Lack of SPAWAR support*

◆ VISTA Precision Leak Detection

- ◆ *Applied to Tanks 29 and 16*
- ◆ *Required Isolating the Tanks – long turnaround*
- ◆ *Accurate to California Standard*

Leak Detection Challenges

- ◆ **Technical Capability of Leak Detection**
- ◆ **Tank construction challenges**
- ◆ **Ullage requirements**
- ◆ **Timing**

- ◆ **Contractor Partners (Shaw E&I, Michael Baker Corp, Vista)**
- ◆ **Necessity of Ullage**
- ◆ **Water Intrusion**

Conclusions

- ◆ **Aggressive Maintenance Allows continued use of this asset**
- ◆ **Managed Maintenance will minimize ultimate replacement costs**
- ◆ **Environmentally and Economically viable method of fuels storage**

QUESTIONS???

